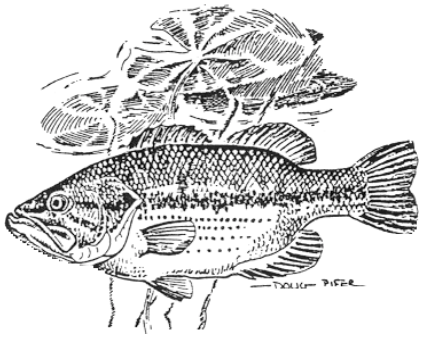
PATOKA LAKE

2000 Fish Management Report

Daniel P. Carnahan
Fisheries Biologist



FISHERIES SECTION
INDIANA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
I.G.C. South, Room W273
402 W. Washington Street
Indianapolis, Indiana 46204

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Dubois, Orange, and Crawford Counties

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INTRODUCTION

Patoka Lake is an 8,800 acre flood control impoundment in south-central Indiana located in Dubois, Orange, and Crawford Counties (Figure 1). The reservoir was created in 1977 when a dam was completed across the Patoka River 13 miles east of Jasper. The Indiana Department of Natural Resources (IDNR) operates four State Recreation Areas at the lake. The Newton-Stewart State Recreation Area is the most developed with campgrounds, swimming beach, visitors center, marina, and other attractions. Ten boat launching ramps provide anglers and boaters access to the lake. Areas for bank fishing are numerous and are located by any road bordering the lake.

Patoka Lake is a multiple use resource and providing quality sport fishing has always been an important objective. A fish eradication project was initiated to remove problem fish such as, carp and gizzard shad, from the watershed prior to the initial restocking of the lake with sport fish. The lake has always been managed for largemouth bass and panfish angling. Largemouth bass were protected by a 14-inch minimum length limit through 1989. A 12 to 15 inch bass slot size limit was enacted in May 1989 to reduce the number of overabundant small bass. The slot limit was changed to a 15-inch minimum length limit in August 1996 to halt sub-slot size bass harvest as bass numbers were adequately reduced through the slot limit. This regulation was also timely due to gizzard shad being found in the lake for the first time in June 1996 (Stefanavage 1997).

The 2000 fisheries management survey, angler creel survey, and bass tournament monitoring were conducted under Division of Fish and Wildlife (DFW) work plan 98739. Work plan objectives are: 1) Manage Patoka Lake to annually provide about 37,000 angler days of largemouth bass fishing, 33,000 days of bluegill/redear sunfish fishing, 15,000 days of crappie fishing, and 6,000 days of catfish fishing with an angler satisfaction rate of 63%, 2) Evaluate the 1997 stocking of surplus striped bass, and 3) Increase the spring largemouth bass tournament catch rate of bass longer than 15 inches to at least 0.05 bass per hour.

Patoka Lake fisheries management surveys were conducted in 1981, 1983, 1984, 1987, 1989, 1991, 1994, 1996, 1997, 1998, and 1999 (Ball and Glander 1985, Glander 1988, Stefanavage 1991 and 1993a, Stefanavage and Carnahan 1995, Stefanavage 1997, Carnahan 1998, 1999, and 2000). A spot check fisheries management survey was conducted during 1995 while a bass research study was conducted during 1985 and 1986 (Stefanavage 1996, Ball 1988). Creel surveys were conducted in 1981, 1982, 1985, 1986, 1989, 1991, 1994, and 1996 (Glander 1983 and 1984, Brown 1987a, 1987b, Stefanavage 1991 and 1993b, Stefanavage and Carnahan 1995, and Stefanavage 1997). Largemouth bass tournament monitoring surveys were conducted in 1985, 1986, and 1990 through 1999 (Blackwell 1993 and 1994, Carnahan 1993, 1998,

1999, and 2000, Stefanavage and Carnahan 1995, Stefanavage 1995, 1996, and 1997).

METHODS

FISHERIES MANAGEMENT SURVEY

The survey was conducted from May 31 through June 30, 2000. The lake was divided into eight basins, each roughly 1,100 acres in size. Seven of the eight basins received one hour of pulsed D.C. night electrofishing for a total electrofishing effort of 7 hours. Electrofishing was further broken down into 15 minute stations to representatively sample different types of habitat, such as, wood, rip rap, aquatic vegetation, and relatively open shorelines. Two individuals collected fish stunned by the electrofisher. Net effort consisted of 24 standard experimental gill net lifts (panel mesh sizes; ¾ inch, 1 inch, 1¼ inch, 1½ inch, and 2 inch, and all panels 6 feet deep), 21 experimental gill net lifts for sampling striped bass (four different panel mesh sizes consisting of 1½ inch, 2 inch, 2½ inch, and 3 inch, and all panels 10 feet deep) and 16 trap net lifts. The standard gill and trap net effort was equally divided among the eight basins. The striped bass gill nets were set in seven of the eight basins.

Fish collected were measured to the nearest 0.1 inch in total length. Scale samples were taken from a subsample of the sport fish for age and growth determination.

Proportional stock density (PSD) is a length-frequency index which is used to assess the size structure of Patoka Lake's bass, bluegill, and redear sunfish populations (Anderson 1980 and Gabelhouse 1984). PSD is the percentage of quality size fish within a group of stock size fish. Stock size for largemouth bass and bluegill is 8 and 3 inches, while quality size is 12 and 6 inches respectively. Populations dominated by small fish have a low PSD value, while populations dominated by large fish have a high PSD value.

Relative stock density (RSD) is also a length-frequency index used to calculate the percentage of fish from a designated length group out of the total number of stock size fish. The designated lengths used for Patoka Lake largemouth bass are 14 and 15 inches, which is referred to as RSD14 and RSD15. This essentially is the percentage of bass that are longer than 14 and 15 inches divided by the total number of stock size bass. RSD lengths used for Patoka Lake bluegill are 7 and 8 inches which is referred as RSD7 and RSD8. PSD and RSD indices are based on fish caught only by electrofishing.

ANGLER CREEL SURVEY

The stratified sampling design for this creel survey was based on non-uniform angler usage probabilities. This method was modified from resource utilization assessments in Missouri (Fleener 1971, 1976, and 1977) and has been implemented for estimating fishing pressure and harvest at Brookville and Patoka Reservoirs since 1981.

Boat ramp usage probabilities, based on Army Corps of Engineers car count data, were used for the present study (Table 1). Fishing activity probabilities representing the day of the week (0.025 for weekdays versus 0.051 for weekends) and for the time of day (0.25 for the morning shift; 0.75 for the afternoon shift) were also used.

The present creel survey was conducted from April 3 through October 31, 2000. The survey period was

212 days. The single creel clerk's work assignment was based on activity probabilities as generated by a random numbers table and was scheduled for bi-weekly pay periods. The clerk normally worked ten days each pay period.

Table 1. Access site probabilities for the 2000 Patoka Lake angler creel survey.

Access Site	Sampling Probability
Fisherman Campground	0.069
Jackson	0.095
Lick Fork	0.124
Little Patoka	0.068
Newton Stewart Marina	0.138
Newton Stewart South	0.207
Painter Creek	0.131
South Lick Fork	0.088
Walls Ramp	0.080

Anglers were interviewed at the end of their fishing trips. Typical information included the number of anglers in a fishing party, fishing trip length, species sought by anglers, number of harvested fish by species, numbers of largemouth and striped bass released by size group, angler satisfaction with their fishing trip, angler opinion of the striped bass stockings, and angler county of residence. The clerk recorded the total length of harvested fish to the nearest 0.5 inch.

Expansion factors were applied to the daily observation totals for each observed category as described in Glander and Ball (1982) to provide projections of monthly lake-wide fishing pressure and harvest. Each month's set of daily projections were averaged by category to produce estimates of fishing pressure and harvest by species categories. Yield by weight estimates were determined by length group-weight data from the 1999 fisheries management survey.

LARGEMOUTH BASS TOURNAMENT MONITORING SURVEY

Organizations conducting tournaments were asked to measure their own bass. They were provided with a measuring board, plastic washtub, and data sheets. Data sheet information included hours fished, number of participants, and bass lengths to the nearest 0.1 inch. Data was then mailed to the district fisheries office.

Bass brought into the weigh-in station were usually placed in a large recovery tank. The tank contained a solution of water and a chemical, such as "Catch and Release", designed to minimize stress. Fish were then measured and immediately released back into the reservoir.

RESULTS

FISHERIES MANAGEMENT SURVEY

Water chemistry data were standard for the reservoir (Appendix). The reservoir was stratified at the time the survey was conducted. Oxygen was sufficient for sport fish to a depth of 16 feet.

Twenty-three fish species and one hybrid were collected. The total catch was 9,971 fish which weighed 2,499.13 pounds (Appendix). Gizzard shad were most abundant by number followed by bluegill, longear sunfish, largemouth bass, and white crappie. Gizzard shad were most dominant by weight.

Gizzard shad

Gizzard shad were first discovered in Patoka Lake by DFW personnel in 1996. A total of four gizzard shad were collected in 1996. Sampling in 1997 showed the gizzard shad population exploded in one year. With less than half the fish collection effort in 1997 as in 1996, 3,301 shad were sampled that weighed 358.75 pounds.

In 2000, 4,537 shad were sampled that weighed 657 pounds. They accounted for 46% of the collection by number and 26% by weight (Table 2) . Shad relative abundances in 1999 were 50% by number and 38% by weight. Gizzard shad ranged in length from 4.4 to 10.6 inches. Gizzard shad electrofishing catch rates in 1997, 1998, 1999 and 2000 were 825, 637, 732 and 581 per hour respectively.

Table 2. Percent relative abundance by number and weight of selected species from Patoka Lake, 1984-2000.

	SPECIES PERCENT RELATIVE ABUNDANCE BY NUMBER AND (WEIGHT)								
Year	Gizzard shad No. (lbs)	Bluegill No. (lbs)	Largemouth bass No. (lbs)	Longear sunfish No. (lbs)	Redear sunfish No. (lbs)	Steelcolor shiner No. (lbs)	Channel catfish No. (lbs)	White crappie No. (lbs)	Other species No. (lbs)
1984	0	54 (24)	24 (54)	10 (6)	5 (6)	0	0 (0)	* (*)	7 (10)
1987**	0	21 (7)	49 (37)	2 (*)	15 (11)	2 (*)	0 (0)	* (*)	10 (45)
1989	0	32 (9)	47 (41)	4 (1)	9 (7)	2 (*)	0 (0)	0 (0)	7 (41)
1991**	0	28 (14)	17 (30)	19 (5)	10 (12)	15 (1)	* (2)	2 (*)	9 (35)
1994**	0	39 (17)	17 (21)	17 (6)	5 (8)	14 (*)	* (3)	* (*)	9 (46)
1996**	* (*)	46 (20)	18 (30)	16 (4)	4 (6)	2 (*)	* (4)	* (*)	13 (37)
1997	58 (36)	20 (7)	9 (27)	7 (3)	1 (2)	1 (*)	* (*)	* (*)	3 (24)
1998**	46 (32)	21 (7)	9 (30)	10 (3)	1 (2)	4 (*)	* (3)	2 (2)	7 (21)
1999	50 (38)	16 (4)	9 (34)	21 (5)	1 (2)	* (*)	* (3)	* (*)	3 (14)
2000**	46 (26)	21 (4)	9 (25)	12 (2)	1 (1)	1 (*)	2 (9)	4(2)	4 (31)

* Less than 1%.
** Electrofishing, gill nets, and trap nets used, otherwise electrofishing only.

Bluegill

A total of 2,062 bluegill was sampled which weighed 93.85 pounds. The bluegill ranged in length from 1.5 to 8.1 inches. Bluegill ranked second in relative abundance by number (21%) and sixth by weight (4%). The bluegill electrofishing catch rate was 270 per hour. Catch rates for 1996 through 1999 were 431, 278, 232, and 239 per hour respectively (Figure 2). The increase in the bluegill electrofishing catch rate from 1999 to 2000 came primarily from an increase in the number of 3.0 to 5.9 inch bluegill (Table 3). All other bluegill

size groups catch rates decreased or stayed approximately the same. The catch rate for bluegill ranging in length from 6 to 7.9 inches was an all time low of 10 per hour.

Table 3. Bluegill electrofishing catch per hour, Patoka Lake 1985-2000.

BLUEGILL ELECTROFISHING CATCH PER HOUR

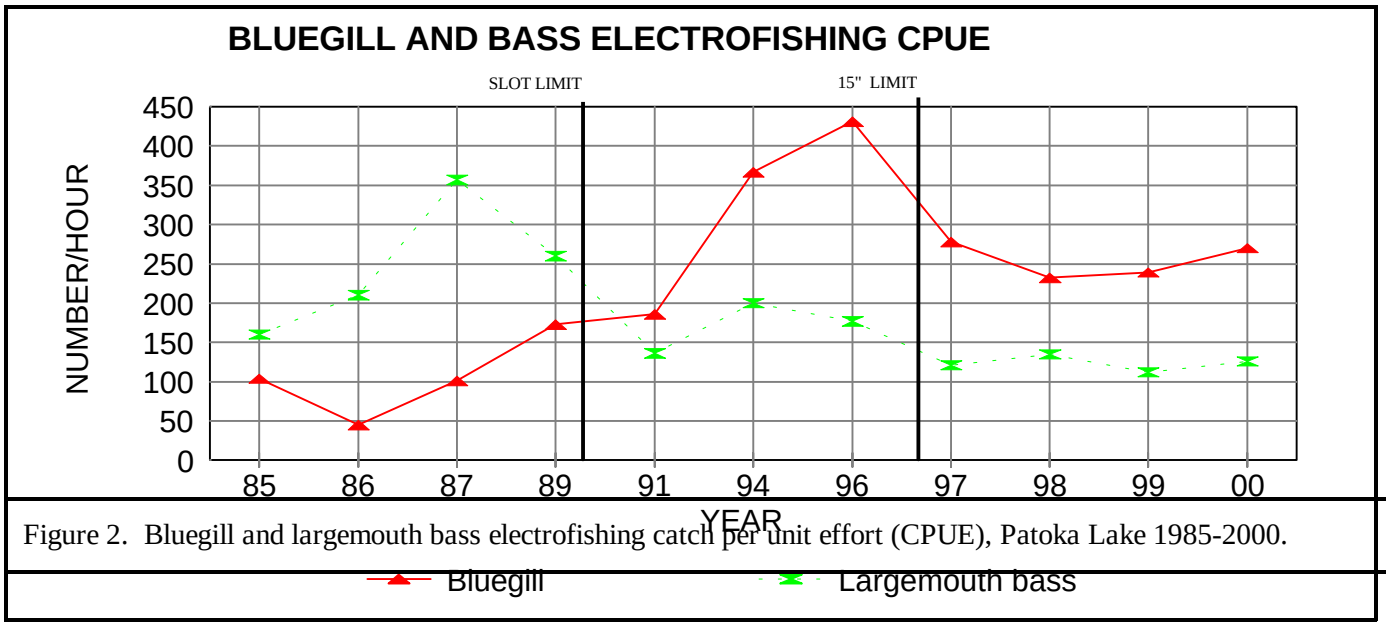

Figure 2. Bluegill and largemouth bass electrofishing catch per unit effort (CPUE), Patoka Lake 1985-2000.

Year	<=2.9 inches	3.0 - 5.9 inches	6.0 - 7.9 inches	>=8.0 inches	Total
1985	12	80	12	0	104
1986	0	17	28	0	45
1987	45	16	39	1	101
1989	31	87	44	11	173
1991	28	123	30	5	186
1994	172	160	28	7	367
1996	144	238	42	7	431
1997	86	164	26	2	278
1998	80	138	13	1	232
1999	83	142	13	0	238
2000	62	198	10	<1	270

Bluegill PSD's have been decreasing since 1987. Since 1987, PSD's have declined from a lake high of 71 to 5 in 2000 (Figure 3). A PSD of 5 indicates that the bluegill population is comprised mostly of fish less than 6 inches in length. Bluegill RSD index values have decreased substantially since 1996. Bluegill RSD7 values from 1996 to 2000 were 9, 5, 3, 3, and 1. RSD8 values were 2 and 1 in 1996 and 1997, and 0 the last three years. These decreases in RSD values represent a dramatic decrease in the number of larger bluegill from 1996 to 2000.

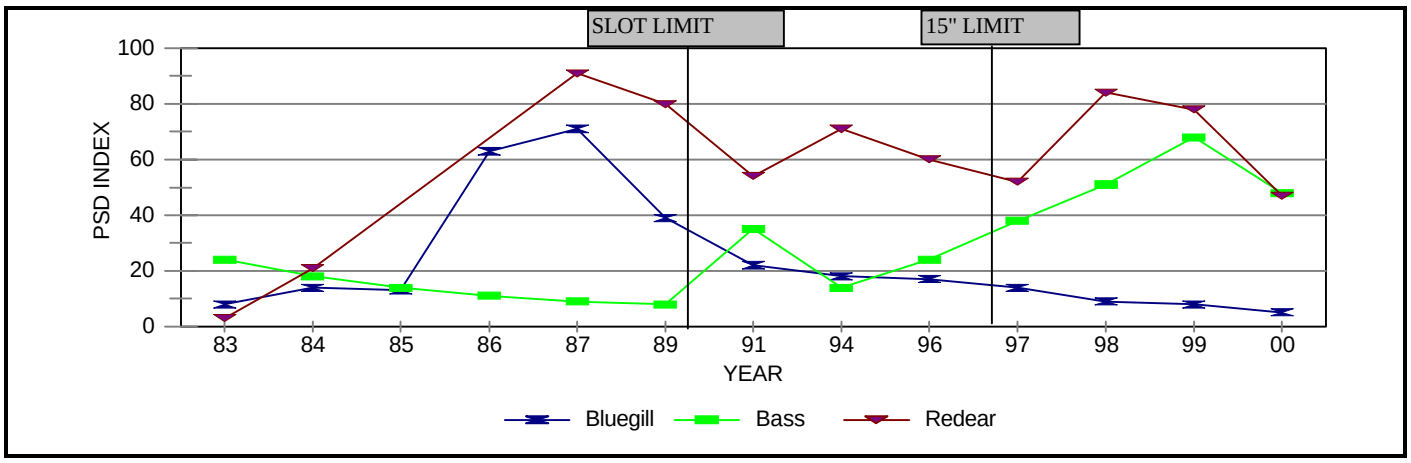

Figure 3. Bluegill, largemouth bass, and redear sunfish proportional stock density (PSD) index values, Patoka Lake 1983-2000.

Bluegill growth in 2000 was considered average when compared to the district averages (Table 4). Bluegill growth rates in 2000 when compared to 1996 growth rates have decreased by at least 1 inch for ages 2 through 5. Age 1 bluegill growth was about the same as last year.

Longear sunfish

A total of 1,223 longear sunfish was sampled that weighed 59.21 pounds. They were third in abundance by number (12%) and ninth by weight (2%), and ranged from 1.8 to 5.8 inches in length. Longear relative abundance by number in 1999 was 21%. Longear sunfish electrofishing catch rates from 1997 to 2000 were 105, 152, 300 and 173 per hour respectively.

Table 4. Bluegill average back calculated lengths (inches), Patoka Lake 1984-2000.

	BLUEGILL AGE (years)					
Year	One	Two	Three	Four	Five	Six
1984	2.4	3.7	5.1	6.4		
1987	2.5	3.7	5.2	6.1	7.0	7.7
1989	2.2	4.0	6.0	7.2	7.9	8.5
1991	1.7	3.5	6.0	7.4	8.2	8.6
1994	1.6	3.6	6.3	8.0	8.6	9.1
1995	1.6	3.5	6.2	7.6	8.4	
1996	1.8	4.0	6.8	8.0	8.8	
1997	1.7	4.0	5.9	7.1	7.7	
1998	1.6	3.3	5.3	6.7	7.5	8.2
1999	1.6	3.2	4.9	6.4		
2000	1.8	3.2	5.1	6.4	7.3	
District avg.	1.7	3.3	4.8	6.1	6.9	7.6

Largemouth bass

The 904 largemouth bass sampled weighed 613.68 pounds which accounted for 9% of the collection by number and 25% by weight. They ranged in length from 1.0 to 22.5 inches. The 2000 electrofishing catch rate was 126 per hour. Electrofishing catch rates in 1997, 1998 and 1999 were 121, 145, and 133 per hour respectively. Catch rates by length class increased by 28 per hour for bass between 3 and 12 inches. This was the first substantial increase of bass less than 12 inches since shad have dominated the fishery. These smaller bass should recruit to larger size classes with the presence of an abundant forage base. Bass catch rates in the 12 to 15 inch size category decreased from 48 per hour in 1999 to 30 in 2000. This was the first decrease in this size class since 1994. The decrease was due to the poor survival of young bass since 1997. The catch rate for bass in the 15 to 20 inch size group increased by 3 per hour from 1999 to 2000, and bass larger than 20 inches remained about the same (Table 5). Bass growth increased for all ages and was above the district averages for southwest Indiana (Table 6). Growth should be exceptional for larger bass that can effectively prey on gizzard shad.

Table 5. Largemouth bass electrofishing catch per hour, Patoka Lake, 1985-2000.

	LARGEMOUTH BASS ELECTROFISHING CATCH PER HOUR					
Year	3.0 - 7.9 inches	8.0 - 11.9 inches	12.0 - 14.9 inches	15.0 - 19.9 inches	>=20.0 inches	Total
1985	37	105	14	3	<1	159
1986	67	128	10	4	1	210
1987	166	174	13	4	<1	357
1989	55	196	8	<1	1	260
1991**	62	111	46	4	<1	223
1991	51	55	28	2	0	136
1994**	125	144	16	3	<1	288
1994	110	77	10	2	<1	199
1996	84	71	18	4	<1	177
1997	23	62	32	4	0	121
1998	38	56	38	6	0	138
1999	28	27	48	8	1	112
2000	38	45	30	11	<1	124

** Spring collection where bass were the only species collected.

Table 6. Largemouth bass average back calculated lengths (inches), Patoka Lake, 1984-2000.

	LARGEMOUTH BASS AGE (years)						
Year	One	Two	Three	Four	Five	Six	Seven
1984	4.4	8.1	11.1	14.2	16.5		
1987	4.4	7.8	10.6	12.7	14.7	16.7	
1989	5.0	8.4	11.0	12.6	13.6		
1991	5.2	8.8	11.5	13.7	15.3	16.3	
1994	5.1	9.1	12.2	14.4	16.0	17.4	
1995	5.1	9.1	11.9	14.4	16.4		
1996	5.7	9.6	12.9	14.9	17.0	18.9	
1997	5.0	8.9	11.6	13.7	15.2	16.8	
1998	4.9	8.9	11.4	13.5	15.2	16.2	
1999	4.1	7.5	10.5	13.2	15.0	15.9	
2000	5.4	9.5	12.5	14.8	16.5	17.9	19.4
District avg.	4.2	7.6	10.2	12.1	13.7	15.9	16.9

The proportion of larger bass in Patoka's bass population decreased from 1999 to 2000, due to the increased catch of bass less than 12 inches. This was documented by bass PSD's (Figure 3). Bass PSD values in 1994, 1996, 1997, 1998, and 1999 were 14, 24, 38, 51 and 68 respectively. The PSD in 2000 was 48. The decrease was due to the increased catch of bass from 8 to 12 inches in length. A PSD of 48 is a good indicator of a well balanced bass population.

Bass RSD14 and RSD15 values continued to increase from 1997 levels. RSD14 values were 9, 12,

26, and 27 from 1997 through 2000. RSD15 values from 1997 through 2000 were 4, 7, 11, and 13. These index values indicate that bass fishing for “keeper” size fish should be excellent.

White crappie

A total of 390 white crappie was sampled that ranged in length from 4.1 to 13.7 inches. They accounted for 4% of the collection by number and 2% by weight. Their percent relative abundance by number doubled since 1998. White crappie catch rates have substantially increased since 1996. White crappie catch rates were 5 per hour of electrofishing, 14 per standard gill net lift, and 1 per trap net lift. White crappie catch rates in 1998 were 2 per hour of electrofishing, 5 per gill net lift, and 3 per trap net lift. White crappie catch rates in 1996 were less than 1 per hour electrofishing, 1 per gill net lift, and less than 1 per trap net lift. Their back calculated growth rates were excellent (Table 7). Ages 2, 3, 4, and 5 experienced superior growth when compared to the district averages. Back calculated lengths at ages 2, 3, 4, and 5 were 6.5, 9.5, 11.5, and 13.1 inches respectively. This growth was similar to 1998 results.

Table 7. White crappie average back calculated lengths (inches), Patoka Lake, 1991-2000.

	WHITE CRAPPIE AGE (years)				
Year	One	Two	Three	Four	Five
1991	3.2	5.6	8.3		
1994	3.7	7.2	9.1		
1995*					
1996	3.5	7.0	9.2		
1997*					
1998	3.2	6.6	9.7		
1999	3.0				
2000	3.1	6.5	9.5	11.5	13.1
District avg.	3.3	5.8	7.7	8.8	10.2

* Sample size too small to get accurate back calculated lengths.

Channel catfish

A total of 159 channel catfish was sampled that weighed 224.01 pounds. The catfish ranged in length from 6.6 to 27.0 inches. They accounted for 2% of the collection by number and 9% by weight. These were the highest relative abundances for channel catfish ever recorded for Patoka Lake. Catch rates were 1 per hour of electrofishing, 6 per standard gill net lift, and 1 per lift from the gill nets used for capturing striped bass. Channel catfish were found in abundance throughout the entire lake.

White bass

One hundred twenty-seven white bass were sampled that weighed 106.56 pounds, and ranged in length from 7.2 to 15.5 inches. They accounted for 1% of the sample by number and 4% by weight. White bass catch rates were 1 per hour of electrofishing, 2 per standard gill net lift, and 4 per lift from the gill nets used for capturing striped bass. Only 13 white bass were captured in 1998 which was the last Patoka Lake fish survey with gill netting effort. Back calculated lengths averaged 6.7, 11.7, and 13.5 inches for ages 1

through 3.

Redear sunfish

A total of 114 redear sunfish was sampled which weighed 32.54 pounds. The redear ranged in length from 4.1 to 9.6 inches. Redear accounted for 1% of the collection by number and weight. The electrofishing catch rate was 12 per hour, which was similar to 1999 results. The standard gill net catch rate was less than 1 per lift and the trap net catch rate was 1 per lift.

Redear sunfish PSD value was 47. Past PSD values were 78 (1999), 84 (1998), and 52 (1997) (Figure 3). The RSD8 index values for 1998 through 2000 were 69, 74, and 31.

Redear back calculated growth rates slightly decreased from 1999 levels (Table 8). Growth rates were average for all ages when compared to district averages.

Table 8. Redear sunfish average back calculated lengths (inches), Patoka Lake 1983-2000.

	REDEAR SUNFISH AGE (years)					
Year	One	Two	Three	Four	Five	Six
1983	2.4	4.2	5.8	7.1		
1987	2.1	3.8	5.3	6.6	7.5	8.2
1989	2.0	4.6	6.7	7.9	8.6	8.9
1991	1.9	4.7	6.9	8.0	8.6	9.0
1994	2.1	4.6	6.9	8.2	8.9	9.5
1995	1.9	4.5	6.8	8.6	9.8	10.3
1996	1.9	4.3	6.7	8.0	9.0	9.7
1997	1.7	4.1	5.7	6.8	7.7	
1998	1.9	4.1	6.0	7.4	8.4	9.2
1999	2.0	4.4	6.6	7.9	8.6	9.3
2000	2.0	4.2	6.1	7.4	8.1	8.6
District avg.	2.0	4.5	6.3	7.5	8.5	9.3

Striped bass

A total of 20 striped bass was sampled which weighed 79.48 pounds. The striped bass ranged in length from 11.3 to 24.2 inches. They accounted for less than 1% of the sample by number and 3% by weight. Striped bass were sampled from the three previous stockings. The largest striper sampled weighed 8 pounds and was 3 years old. Striped bass catch rates were 0 per electrofishing hour and less than 1 per standard gill net and striped bass gill net lifts.

Other Fish Species

Fourteen species and one hybrid sunfish comprised the remainder of the sample. Collectively, they accounted for 4% of the collection by number and 24% by weight (Appendix). Steelcolor shiner, spotted sucker, and common carp were the three most abundant “other fish” species sampled by number while common carp accounted for most of the weight. Other game fish species sampled were 28 black crappie,

eight smallmouth bass, one northern pike, and one walleye.

Steelcolor shiner and bluntnose minnow electrofishing catch rates were 18 and 8 per hour respectively. This was an increase from the 5 per hour for each species sampled in 1999, but was still low compared to the 1998 catch rates of 65 steelcolor and 41 bluntnose per hour. Steelcolor shiner electrofishing catch rates in 1996 and 1997 were 23 and 19 per hour respectively.

ANGLER CREEL SURVEY

Fishing Pressure and Overall Harvest Rates

An estimated 69,676 anglers fished approximately 341,606 hours (39 hours per acre) from April 3 through October 31, 2000 (Table 9). Fishing pressure peaked in May. In 1996, approximately 84,215 anglers fished 475,071 hours (54 hours per acre) during the same time frame.

Monthly harvest rates ranged from 0.14 fish per hour in August to 0.59 fish per hour in April. The overall harvest rate was 0.33 fish per hour. The overall harvest rate in 1996 was 1.18 fish per hour. The overall catch rate at Patoka Reservoir in 2000, which includes largemouth bass and striped bass that were caught and released, was 0.58 fish per hour. The overall catch rate in 1996 was 1.29 fish/hour.

Table 9. Estimated number of anglers, hours of fishing pressure, and overall harvest rates by month at Patoka Lake, 2000.

Month	Number of Anglers	Fishing Pressure (hours)	Harvest Rate (Fish/Hour)
April	8,034	37,656	0.59
May	16,298	85,896	0.47
June	9,956	47,398	0.32
July	8,934	45,919	0.16
August	6,704	29,218	0.14
September	11,580	58,137	0.26
October	8,171	37,383	0.25
Totals	69,676	341,606	0.33

Species Sought by Anglers

Largemouth bass were the most sought after fish at Patoka Lake in 2000 (Table 10). Largemouth bass fishing preference increased from 23% in 1996 to 39% in 2000. Anglers preferring crappie ranked second at 35%, which was a substantial increase from 10% in 1996. Bluegill and redear sunfish fishing preference decreased from 57% in 1996 to 14% in 2000, which reflects directly on the negative changes occurring in the bluegill population since 1996. Other species anglers preferred were anything that bites (10%), catfish (2%), and striped bass (1%).

Table 10. Species preferred by anglers during creel surveys at Patoka Lake, 1991-2000

	% Largemouth	% Bluegill/	% Anything	% Striped

Year	bass	Redear	% Crappie	or other	% Catfish	bass
1991	38	45	4	13	0	0
1994	30	56	6	8	0	0
1996	23	57	10	10	0	0
2000	39	14	35	10	2	1

Harvest and Yield

The total estimated harvest by number in 2000 was 113,665 fish which weighed 35,376.06 pounds (Table 11). Peak harvest occurred in May (36% of total) followed by April and June at 20% and 13% respectively.

Table 11. Numbers and pounds of fish harvested at Patoka Lake from April 3-October 31, 2000.

Species	Harvest by Number	Percent of Total	Harvest by Weight (lbs)	Percent of Total
Crappie	75,635	66.5	23,446.85	66.3
Bluegill	33,777	29.7	5,066.55	14.3
Largemouth bass	1,720	1.5	3,835.60	10.8
Channel catfish	1,197	1.1	1,568.07	4.4
White bass	727	0.6	610.68	1.7
Striped bass	312	0.3	780.00	2.2
Redear sunfish	297	0.3	68.31	0.2
Totals	113,665		35,376.06	

Total harvest by number decreased by 445,603 fish from 1996 to 2000. Total yield decreased by 224,196 pounds from 1996 to 2000. Most species total harvest decreased from 1996 to 2000. Redear sunfish, bluegill, largemouth bass, and crappie percent change in the harvest from 1996 to 2000 was -96%, -92%, -88%, and -21% respectively (Table 12). The largest decrease in harvest was bluegill. The bluegill harvest was 440,037 fish in 1996 compared to 33,777 in 2000. Channel catfish harvest increased by 360% from 1996 to 1,197 fish. It is assumed that the catfish harvest was greatly underestimated. The underestimate was primarily due to the creel being conducted at boat ramps mostly during daylight hours, hence, catches from anglers fishing for catfish from shore were not included in the data unless they were fishing from a boat ramp.

Table 12. Number harvested and percent change of selected species from 1996-2000 at Patoka Lake.

	NUMBER HARVESTED						
Year	Crappie	Bluegill	Largemouth Bass*	Channel Catfish	White bass	Redear sunfish	Totals
1996	95,887	440,037	14,763	260	1,487	6,633	559,067
2000	75,635	33,777	1,720	1,197	727	297	113,353
% change	-21%	-92%	-88%	+360%	-51%	-96%	-80%

* Total bass caught increased from 66,255 in 1996 to 85,046 in 2000 which was a 28% increase.

Fishing Pressure and Success Comparisons

Fishing pressure, harvest, yield, and harvest rate all decreased substantially since 1996 (Table 13). Fishing pressure decreased by 15 hours per acre and the harvest rate decreased by nearly 1 fish per hour from 1996 to 2000. Most of the changes can be contributed to the demise of the great bluegill fishing at the lake. Bluegill anglers have always been a major user of the fishery and it appears they are now finding other lakes to fish that are better for bluegill fishing. Patoka's fish harvest and harvest rate are now similar to other large gizzard shad dominated reservoirs in the state, such as, Lake Monroe, Brookville Lake, Harden Lake, and Eagle Creek Reservoir.

Crappie dominated the harvest and yield of the survey followed by bluegill and largemouth bass (Table 14). This was the first creel survey at Patoka Lake that bluegill did not rank first in the harvest and yield. Crappie dominated the harvest by nearly 5 fish per acre. The bluegill harvest rate decreased from 50 per acre in 1996 to 4 per acre in 2000.

Harvest rates decreased for all species except crappie and crappie only increased slightly from 1996. The bluegill harvest rate decreased from nearly 1 fish per hour to 0.10.

Bluegill, redear sunfish, and crappie average harvested lengths were 6.1, 7.1, and 8.8 inches respectively in 2000. They all decreased from 1996 levels. In 1996, the average lengths for harvested bluegill, redear sunfish, and crappie were 8.5, 9.5, and 10.0 inches respectively. The largemouth bass average harvested length increased from 11.5 to 16.5 inches. This was due to the 15 inch minimum length limit imposed in August 1996, which protected small bass from being harvested. The striped bass and channel catfish average lengths harvested were 18.1 and 16.4 inches.

A total of 1,720 largemouth bass was harvested (Table 15). All were at least 15 inches in length. In 1996, 1,152 bass were harvested which exceeded 15 inches. Caught and released bass accounted for 98% of the total bass catch. A total of 83,326 bass was released, of which, 71,804 (86%) were less than 15 inches and 11,522 (14%) were greater than 15 inches. There were 9,298 more bass longer than 15 inches caught and released in 2000 versus 1996. The catch rate also increased from 0.004 legal bass per hour in 1996 to 0.033 in 2000. The total bass catch (harvested plus released) was 85,046, which was an increase of 18,791 bass compared 1996 values.

Table 13. Comparisons of fishing pressure, fish harvest, yield, and harvest rates from angler creel surveys conducted at Patoka Lake, 1981-2000, and other Indiana reservoirs.

Lake and Year	Fishing Pressure (hours/acre)	Fish Harvest (number/acre)	Yield (lbs./acre)	Harvest Rate (fish/hour)
Patoka (8,800 acres)				
1981	88.8	22.8	*	0.26
1982	43.4	11.8	4.8	0.27
1985	53.7	43.9	12.4	0.82
1986	41.8	64.7	16.3	1.55
1989	45.1	23.4	11.1	0.52
1991	67.0	53.3	23.5	0.80
1994	54.3	41.0	17.4	0.76
1996	54.0	63.6	29.5	1.18
2000	38.8	12.9	4.0	0.33
Monroe (10,750 acres)				
1991	47.6	17.2	6.4	0.36
1994	56.4	15.5	9.0	0.27
2000	33.7	13.1	*	0.38
Brookville (5,260 acres)				
1984	73.9	16.3	8.5	0.23
1989	63.6	21.1	*	0.33
1990	69.8	39.3	*	0.56
1991	73.1	34.6	16.8	0.47
1994	69.7	14.5	10.2	0.21
Harden (2,060 acres)				
1986	58.3	18.0	8.8	0.31
1988	79.0	23.9	*	0.30
1994	49.3	26.3	8.0	0.53
1997	54.2	37.2	14.5	0.62
1998	63.7	32.5	16.3	0.51
Eagle Creek (1,350 acres)				
1986	36.1	30.8	*	0.91
1998	54.0	39.4	15.0	0.73

* Data not reported

Table 14. Comparison of harvest, yield, harvest rate, and average length for fish from angler creel surveys at Patoka Lake, 1986-2000.

	YEAR					
Species	1986	1989	1991	1994	1996	2000
Fish harvest (Number/Acre)						
Bluegill	55.1	12.5	40.6	33.0	50.0	3.8
Largemouth bass	0.5	6.9	3.5	2.2	1.7	0.2
Crappie	3.6	2.3	3.4	3.6	10.9	8.6
Redear sunfish	5.2	1.2	4.8	1.7	0.8	<0.1
Striped bass*						<0.1
Channel catfish	**	<0.1	<0.1	<0.1	<0.1	0.1
Yield (Pounds/Acre)						
Bluegill	12.3	6.3	15.3	13.5	23.5	0.6
Largemouth bass	1.2	3.4	4.4	1.4	1.1	0.4
Crappie	0.8	0.9	1.4	1.4	4.3	2.7
Redear sunfish	1.6	0.5	1.9	0.6	0.4	0.0
Striped bass						0.1
Channel catfish	**	**	0.1	<0.1	<0.1	0.2
Harvest Rate (Fish/Hour)						
Bluegill	1.32	0.28	0.61	0.61	0.93	0.10
Largemouth bass	0.01	0.15	0.05	0.04	0.03	0.01
Crappie	0.09	0.05	0.05	0.07	0.20	0.22
Redear sunfish	0.12	0.03	0.07	0.03	0.01	<0.01
Striped bass						<0.01
Channel catfish	**	<0.01	<0.01	<0.01	<0.01	<0.01
Average Length (Inches)						
Bluegill	7.0	8.3	7.8	7.8	8.5	6.1
Largemouth bass	16.6	10.7	13.9	11.3	11.5	16.5
Crappie	8.1	9.2	10.2	9.4	10.0	8.8
Redear sunfish	7.2	8.4	8.4	8.1	9.5	7.1
Striped bass						18.1
Channel catfish	**	**	**	**	**	16.4

* Striped bass were first stocked in 1997.
** Data not reported.

Table 15. Estimated number (percent) of largemouth bass harvested and caught and released from Patoka Lake, 1985-2000

Harvest	YEAR						
Largemouth bass	1985*	1986*	1989**	1991**	1994**	1996**	2000***
>= 14 inches	8,965 (100)	4,532 (100)					
< 12 inches			59,539 (98)	27,901 (90)	17,257 (90)	13,508 (92)	0
12 to 15 inches			121 (<1)	1,185 (4)	382 (2)	103 (<1)	0
>= 15 inches			1,032 (2)	2,089 (7)	1,452 (8)	1,152 (8)	1,720 (100)
Totals	8,965	4,532	60,692	31,175	19,091	14,763	1,720
Number/hour	0.02	0.01	0.15	0.05	0.04	0.03	< 0.01
Number/acre	1.0	0.5	6.9	3.5	2.2	1.7	0.2
Released			YEAR				
Largemouth bass	1985*	1986*	1989**	1991**	1994**	1996**	2000***
< 14 inches	152,684 (99)	73,972 (97)					
>= 14 inches	1,109 (1)	2,203 (3)					
< 12 inches			140,079 (83)	63,821 (44)	60,367 (69)	20,954 (41)	
12 to 15 inches			28,069 (17)	78,091(53)	25,311 (29)	28,314 (55)	
< 15 inches							71,804 (86)
>= 15 inches			613 (<1)	4,415 (3)	2,461 (3)	2,224 (4)	11,522 (14)
Totals	153,793	76,175	168,761	146,327	88,139	51,492	83,326
Number/hour	0.32	0.20	0.43	0.25	0.19	0.11	0.24
Number/acre	17.5	8.7	19.2	16.6	10.0	5.9	9.5
Total largemouth bass caught			YEAR				
	1985*	1986*	1989**	1991**	1994**	1996**	2000***
< 14 inches	10,074 (6)	73,972 (92)					
>= 14 inches		6,735 (8)					
< 12 inches			199,618 (87)	91,722 (52)	77,624 (72)	34,462 (52)	
12 to 15 inches			28,190 (12)	79,276 (45)	25,693 (24)	28,417 (43)	
< 15 inches							71,804 (84)
>= 15 inches			1,645 (1)	6,504 (4)	3,913 (4)	3,376 (5)	13,242 (16)
Totals	162,758	80,707	229,453	177,502	107,230	66,255	85,046
Number/hour	0.34	0.22	0.58	0.30	0.23	0.14	0.25
Number/acre	18.3	9.1	26.1	20.2	12.2	7.5	9.7

* 14 inch largemouth bass minimum length limit.
** 12 to 15 inch largemouth bass slot length limit.
*** 15 inch largemouth bass minimum length limit.

Angler Satisfaction with Fishing Trip and Striped Bass Stockings

Anglers were asked two questions during their interview with the creel clerk. The first question asked was “Were you satisfied with your fishing trip?,” and the second question asked was “Are you in favor of the striped bass stockings?.” Responses to the questions indicated that 93% of the anglers were satisfied with their fishing trip, and 94% of the interviewed anglers were in favor of the striped bass stockings.

Angler County or State of Residency

Residents from 83 of Indiana's 92 counties fished Patoka Lake between April 3 and October 31, 2000. More anglers from Kentucky (10%) fished at the lake than from any one county in Indiana (Table 16). The

top six Indiana counties from which anglers visited the lake were Floyd (8%), Orange (8%), Harrison (7%), Clark (7%), Marion (5%), and Dubois (5%). All of these counties are near the lake except for Marion, which is the Indianapolis area. Anglers from other states besides Indiana comprised 13% of the angler parties that fished Patoka Lake during the 2000 creel survey.

Table 16. Origin of anglers interviewed at Patoka Lake during 2000.

County	Number of Parties	Percent	County	Number of Parties	Percent	County or State	Number of Parties	Percent
Floyd	138	8.2	Gibson	9	0.5	Fulton	2	0.1
Orange	128	7.6	Ripley	9	0.5	Montgomery	2	0.1
Harrison	112	6.7	Lake	9	0.5	Ohio	2	0.1
Clark	112	6.7	Posey	9	0.5	Dekalb	2	0.1
Marion	91	5.4	Henry	8	0.5	Warren	2	0.1
Dubois	81	4.8	Perry	8	0.5	Daviess	2	0.1
Crawford	69	4.1	Pike	8	0.5	Clay	2	0.1
Lawrence	52	3.1	Marshall	7	0.4	Sullivan	2	0.1
Washington	46	2.7	Kosciusko	7	0.4	Whitley	2	0.1
Vanderburgh	43	2.6	Boone	7	0.4	Elkhart	1	0.1
Johnson	33	2.0	Jennings	6	0.4	Switzerland	1	0.1
Madison	30	1.8	LaPorte	6	0.4	Cass	1	0.1
Hamilton	22	1.3	Vigo	6	0.4	Wells	1	0.1
Scott	19	1.1	Putnam	6	0.4	Blackford	1	0.1
Bartholomew	18	1.1	Miami	6	0.4	Noble	1	0.1
Monroe	17	1.0	Grant	5	0.3	Allen	1	0.1
Jackson	17	1.0	Huntington	5	0.3	Steuben	0	0.0
Warrick	17	1.0	Randolph	5	0.3	Benton	0	0.0
Hendricks	17	1.0	Parke	5	0.3	Starke	0	0.0
Delaware	16	1.0	Pulaski	5	0.3	Fountain	0	0.0
Martin	16	1.0	Decatur	4	0.2	Adams	0	0.0
Spencer	15	0.9	Dearborn	4	0.2	Wabash	0	0.0
Tippecanoe	15	0.9	Jay	4	0.2	Tipton	0	0.0
Jefferson	15	0.9	Franklin	4	0.2	LaGrange	0	0.0
Shelby	14	0.8	Knox	3	0.2	Union	0	0.0
Brown	14	0.8	Owen	3	0.2	**Out-of-State**		
St. Joseph	13	0.8	Greene	3	0.2	Kentucky	174	10.3
Clinton	13	0.8	Wayne	3	0.2	Ohio	28	1.7
Porter	13	0.8	White	3	0.2	Illinois	16	1.0
Morgan	11	0.7	Jasper	3	0.2	Michigan	2	0.1
Carroll	10	0.6	Newton	3	0.2	Arkansas	1	0.1
Hancock	10	0.6	Rush	3	0.2	Florida	1	0.1
Vermillion	10	0.6	Fayette	2	0.1	Wisconsin	1	0.1
Howard	9	0.5						

Economic Value of the Fishery

Fishing related expenditures such as bait, tackle, food, license fees, lodging, and transportation represent a monetary value for the Patoka Lake fishery. The average cost of Indiana anglers for a fresh water fishing trip was $59.53 in 1996, according to a national survey of fish and wildlife recreation activity (U.S. Department of Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census 1997). The $59.53 average was used for determining the economic value of Patoka Lake's fishery in 2000. The estimated 69,676 anglers who fished at Patoka during the survey period in 2000 represented an estimated total value of $4,147,812 for the fishery.

LARGEMOUTH BASS TOURNAMENT MONITORING SURVEY

Largemouth bass tournament monitoring was initiated in 1985 and since then tournaments have been monitored during 1986, and 1990 through 2000. A record 13 tournaments provided catch data in 2000 (Table 17).

Table 17. Largemouth bass tournaments monitored at Patoka lake, 2000.

Date	Organization
March 18	Patoka Valley Bassmasters
March 19	Indiana Bass Federation
March 26	Hoosier Open
April 1	Operation Bass
April 2	Indiana Choice Events
April 8	Fishers of Men
April 12	Indiana Senior Bass Tournaments
May 13	Discount Labels
May 20	Indiana Choice Events
May 21	Jasper Bassmasters
September 10	Jasper Bassmasters
September 16	United Steelworkers
September 17	United Steelworkers
September 23	Hoosier Open
September 24	Hoosier Open

The number of 15 inch or longer bass caught in the ten spring tournaments ranged from 23 to 253 bass. Spring tournament catch rates ranged from 0.030 to 0.122 and averaged 0.075 legal bass per hour (Table 18). The 2000 overall catch rate was a record high (Figure 4).

Ninety percent of the 2000 spring tournament bass ranged between 15 and 17.5 inches, 8% between 18 and 19.5 inches, and 2% greater than 20 inches (Figure 5). Big bass weighed in ranged between 3.30 pounds to 8.19 pounds and averaged 6.07 pounds. In two of the tournaments, the largest bass weighed more than 7 pounds. The average length of all bass weighed in was 16.0 inches.

Table 18. Length (inches) and catch rates of largemouth bass caught in spring tournaments, Patoka Lake 2000.

Length	Tournament Dates											Percent
(inches)	3/18	3/19	3/26	4/1	4/2	4/8	4/12	5/13	5/20	5/21	Total	by length
15	35	61	59	152	21	10	12	7	24	39	420	33.6
15.5	31	26	46	20	20	5	14	7	24	38	231	18.5
16	18	17	42	41	13	8	13	3	12	40	207	16.5
16.5	8	14	30	12	12	2	6	2	11	16	113	9.0
17	9	15	20	11	5	5	7	2	7	17	98	7.8
17.5	8	10	19	4	1	3	4	1	2	9	61	4.9
18		6	14	4	4	1			2	11	42	3.4
18.5		4	4	4	2		1		1	5	21	1.7
19	1	3	7	3	2					3	19	1.5
19.5	1	2	4	1	1	1				2	12	1.0
20	2	4	1	1			2			6	16	1.3
20.5		1			1						2	0.2
21		2				1	1	1			5	0.4
21.5											0	0.0
22		1					1				2	0.2
22.5										1	1	0.1
23											0	0.0
23.5											0	0.0
24											0	0.0
24.5											0	0.0
25							1				1	0.1
Number of bass caught	113	166	246	253	82	36	62	23	83	187	1,251	
Number of anglers	220	280	356	356	84	62	90	108	86	300	1,942	
Tournament length (hrs)	8	9	9	9.5	8	8.75	8	7	8.5	8		
Catch rate (#/hour)	0.064	0.066	0.077	0.075	0.122	0.066	0.086	0.030	0.114	0.078	0.075	
Weight of big bass (lbs)	8.19	6.79	6.73	6.43	4.81	5.54	7.70	5.12	3.30	6.12		

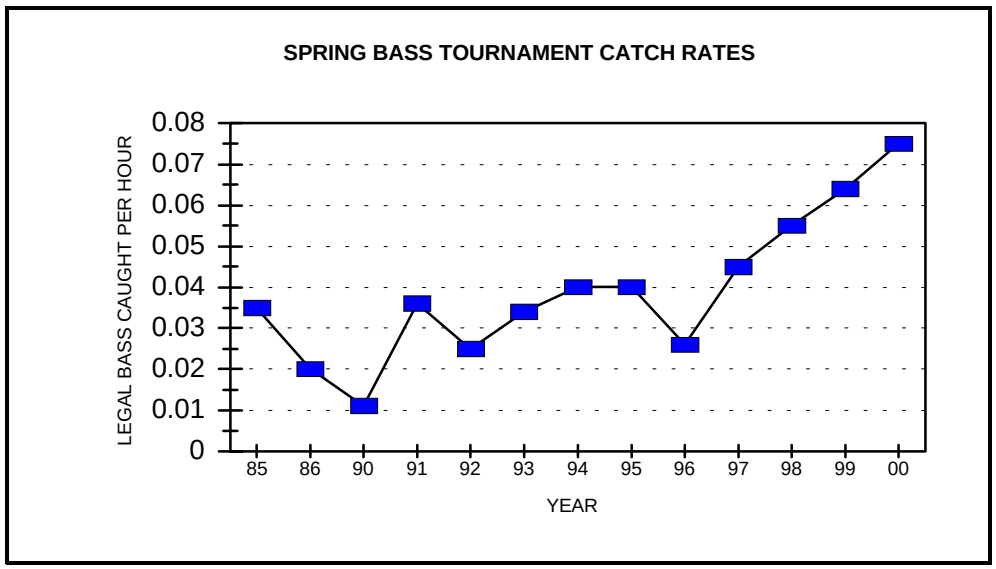

Figure 4. Spring tournament catch rates of largemouth bass longer than 15 inches, Patoka Lake 1985, 1986, 1990-2000.

There were three fall tournaments monitored, of which, two were two day tournaments. They had an average catch rate of 0.070 legal bass per hour (Table 19). Catch by length categories results were similar to the spring tournaments results. The average length of weighed in bass was 16.2 inches and the average weight for each tournament's largest bass was 4.97 pounds.

CONCLUSIONS AND RECOMMENDATIONS

Best fishing at Patoka Lake in 2000 was for largemouth bass, crappie, and channel catfish. The average size largemouth harvested was 16.5 inches while the average length weighed in for tournament anglers was 16.0 inches. There were approximately 18,791 more bass caught in 2000 versus 1996. The number of bass caught that were greater than 15 inches also increased from 3,376 in 1996 to 13,242 in 2000. The average length of crappie harvested was 8.8 inches and they dominated the harvest and yield for the first time. Channel catfish were found to be abundant throughout the lake. The channel catfish population has exploded since gizzard shad have dominated the forage base. Channel catfish catch rates increased from less than 2 per gill net lift in 1996 to 6 per lift in 2000. The average size channel catfish harvested was 16.4 inches.

Fishing pressure and harvest have substantially decreased since 1996. Fishing pressure decreased by 15 hours per acre and 14,539 less anglers fished the lake in 2000 versus 1996. This decrease can be associated with the poor bluegill fishing since gizzard shad have become established in the lake. The percentage of anglers fishing for bluegill in 1996 was 57%, while in 2000 they totaled 14%. That also corresponded to the large decrease in the number of harvested bluegill. The bluegill harvest decreased by 406,260 fish in 2000 to 33,777 when compared to 1996 figures. The total harvest decreased by 445,603 fish to 113,665 since 1996.

Table 19. Length (inches) and catch rates of largemouth bass caught in fall tournaments, Patoka Lake 2000.

Length (inches)	Tournament Dates 09/10	09/16	09/17	09/23	09/24	Total	Percent by length
15	27	7	7	35	27	103	26.3
15.5	32	4	3	31	18	88	22.5
16	19	3	3	12	17	54	13.8
16.5	12	1		16	12	41	10.5
17	12	6		10	9	37	9.5
17.5	8			10	3	21	5.4
18	4	1	1	3	2	11	2.8
18.5	2	1		6	2	11	2.8
19	3			11		14	3.6
19.5	1			4	1	6	1.5
20			1	1		2	0.5
20.5							0.0
21	1					1	0.3
21.5	1					1	0.3
22	1					1	0.3
Number of bass caught	123	23	15	139	91	391	
Number of anglers	236	93	93	122	122	666	
Tournament length (hrs)	8	9	7	9	9		
Catch rate (#/hour)	0.065	0.027	0.023	0.127	0.083	0.070	
Weight of big bass (lbs)	6.15	2.90	4.45	6.11	5.26		

A major shift in angler preference was towards largemouth bass and crappie. Anglers fishing for largemouth bass increased from 23% to 39%, and crappie anglers increased from 10% to 35%. This reflects the change in the fishery since gizzard shad have become established in the lake. The lake's fishery has shifted from bluegill, redear sunfish, and largemouth bass to gizzard shad, largemouth bass, crappie, channel catfish, white bass, and striped bass. The lake's fishery now resembles other large reservoirs in the state instead of a big farm pond.

The largemouth bass population has improved since 1999. In the last two years the bass population was composed of primarily larger fish with not many smaller bass to take their place. PSD values the last two years have indicated this also with index values of 51 and 68 in 1998 and 1999. However, the electrofishing catch rate for bass ranging in size from 3 inches to 12 inches increased by 28 per hour in 2000 which dropped the PSD to 48. This was the first substantial catch rate increase for this size class since 1996. This new supply of smaller bass should help sustain the excellent bass fishing for the next few years.

White crappie numbers have increased since 1998, even though the crappie harvest decreased by approximately 20,000 fish since 1996. Since 1998, white crappie relative abundance by number,

electrofishing catch rate, and gill net catch rate all doubled. Crappie growth rates were excellent when compared to other lakes in the district. White crappie is now the most preferred panfish by anglers at the lake.

Striped bass were stocked into Patoka Lake in 1997, 1998, and 1999 as an additional predator to prey on gizzard shad. All three stockings were considered successful after fall electrofishing surveys produced high catch rates of young-of-year (YOY) striped bass. One percent of the anglers fished for striped bass during the creel. That number is expected to increase as the fish get larger and word gets out among anglers that striper fishing is available at the lake. Approximately half of the striper fishing parties caught their limit of two fish per angler. It is recommended that surplus striped bass continue to be stocked into Patoka Lake. The stockings should continue to be monitored to determine if a significant striped bass fishery can be developed.

Objectives two, three, and a portion of objective one were accomplished in the current Patoka Lake work plan. Objectives 2 was to evaluate the 1997 striped bass stocking and objective three was to maintain the largemouth bass tournament catch rate of at least 0.05 legal bass per hour. Objective one called for a total of 91,000 angler days with a satisfaction percentage of 63%. The satisfaction rate was met, but the total angler days were not. There was a total of 69,676 angler days from April through October. The major difference was in the number of bluegill fishing days. The objective called for 33,000 bluegill fishing angler days, while the actual total was 9,754.

A new work plan (200739) was developed for Patoka Lake in 1999. Work planned for Patoka in the future will include complete fish management surveys in 2002 and 2004, electrofishing spot check surveys in 2001, 2003, and 2005, YOY striped bass fall indexing in every year that striped bass are stocked, largemouth bass tournament monitoring in 2001 through 2005, specialized crappie sampling in 2002 and 2003, and an angler creel survey in 2003.

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Submitted by: Daniel P. Carnahan, Fisheries Biologist
Date: January 5, 2001

Approved by: _____
Thomas M. Flatt, Fisheries Supervisor

Approved by: _____
William D. James, Chief of Fisheries
Date: April 25, 2001

APPENDIX

Fisheries Management Survey Data